

REMARKS

A. Request for Reconsideration

Applicant has carefully considered the matters raised by the Examiner in the outstanding Office Action but remains of the position that patentable subject matter is present. Applicant respectfully requests reconsideration of the Examiner's position based on the amendments to the specification, the amendments to the claims and the following remarks.

B. The Invention

The present invention is directed to an image-processing apparatus that enables precise frequency characteristic operation, suppresses deterioration of graininess caused by frequency processing and obtains sufficient emphasis.

In one of the novel aspects of the invention, the image-processing apparatus contains a differential processing section that generates a differential image-signal obtained from differences between unsharp image signals and converted unsharp image signals.

In another novel aspect of the invention, the differential processing section applies conversion-processing to the differential image signals where the conversion-processing varies depending on pixel values of the unsharp image-signals.

In yet another novel aspect of the invention, a filter-processing section applies mask-processing to the original image signal, and the mask processing is repetitions of filter-processing with a simple average filter.

In still another novel aspect of the invention, unsharp image-signals are generated by conducting repetitions of filter-processing with a simple average filter.

C. Specification Amendments

The Title of the Invention has been amended to read "Multiresolution Unsharp Image Processing Apparatus" in accordance with the Examiner's suggestion.

The portion of the Background of the Invention beginning at page 4 and ending at page 43 of the Application has been relocated to the Detailed Description of the Preferred Embodiment.

Pages 47 and 48 have been amended to clarify that the converted image signal is the converted "unsharp" image signal. Support for this amendment can be found at page 55, lines 1-4.

D. Claim Status and Amendments

Claims 1-48 and 73-81 are presented for further prosecution. Claims 49-72 have been cancelled by this amendment.

Claim 14 has been amended to correct a minor typographical error.

Claim 39 has been amended to include the limitations of claim 42. Claims 41 and 42 have been cancelled as a result, and claim 43 has been made dependent upon claim 39.

Claim 73 has been amended to include the limitations of claim 75, and to clarify that repetitions of filter processing are conducted to generate each unsharp image-signal. Claim 75 has been cancelled.

It is submitted that no new matter has been added by these amendments.

E. Objections to the Specification

The Examiner had objected to the Title of the Invention as not being descriptive and the Summary of the Invention as not being brief.

Applicants have amended the Title of the Invention in accordance with the Examiner's suggested Title. Applicants appreciate the suggestion.

The portion of the Summary of the Invention that contains the claim language and a description of the effects of the invention has been moved to the Description of the Preferred Embodiment. It is submitted that the Summary of the Invention is now acceptable.

F. Claim Objections

Claim 14 had been objected to as containing a misspelling and claim 72 had been objected to as being dependent on the wrong claim.

The Examiner had suggested various amendments which have been adopted for claim 14. Claim 72 has been cancelled.

G. Claim Rejections under 35 USC § 112

Claims 1 and 14 had been rejected as for containing subject matter that is not described in the specification. The Examiner had stated that the specification does not explain that the differential processing section generates differential image signals between "unsharp image-signals and converted unsharp image-signals".

Applicant respectfully submits that this subject matter is supported at page 55, lines 1-4 of the Application. This portion of the Application explains that the differential processing section indicates a difference between image signals and converted unsharp image signals, as well as between an "unsharp image-signal and a converted unsharp image-signal". Thus, it is respectfully submitted that claims 1 and 14 are supported in the Application.

H. Rejections under 35 USC § 102(b)

Claims 1-81 had been rejected as being anticipated by Ito (US 5,991,457). For each of the independent claims, the Examiner had cited a portion of Ito to teach the claimed limitations.

As discussed above, claims 49-72 have been cancelled. Thus, the Examiner's rejection remains applicable to claims 1-48 and 73-81.

Applicant respectfully disagrees with the Examiner's rejection of claims 1-48 and 73-81 and believes that Ito does not teach or suggest the present invention. Independent claims 1, 14, 27, 39 and 73 will be discussed in turn.

1. Claims 1-26: Ito does not teach or suggest a differential image-signal obtained from differences between unsharp image signals and converted unsharp image signals as recited in claims 1 and 14

Claims 1 and 14 recite that the differential processing section generates differential image signals obtained from differences between unsharp image-signals and converted unsharp image-signals. Thus, claims 1 and 14 recite three distinct image-signals, the original image-signal, the unsharp image-signal and the converted unsharp-image signal.

The Examiner had cited Equation 6 in col. 15 and Equation 13 in col. 31 of Ito to teach the differential processing sections of claims 1 and 14 (see pages 5 and 10 of the Office Action).

Applicant respectfully submits that Equations 6 and 13 of Ito do not teach the differential processing sections of claims 1 and 14. In addition, Applicant submits that Ito does not suggest the converted unsharp image-signals of claims 1 and 14.

Equations 6 and 13 of Ito each specify that each of the unsharp image-signals (S_{usN-1}) are subtracted from an adjacent image signals (S_{usN}). In contrast, claims 1 and 14 recite a difference between the unsharp image-signals and the converted unsharp image-signals. Thus, Ito does not subtract the unsharp image-signals from the converted unsharp image-signals.

Furthermore, Formulas 6 and 13 of Ito do not suggest the generation of the converted unsharp-image signals of claims 1 and 14.

Ito teaches conversion of the difference between respective unsharp image-signals (Equation 10 at col. 25), however, this is not the difference between unsharp image-signals and converted unsharp-image signals themselves. Respectfully, Ito teaches away from the present invention because Ito teaches conversion of the difference, not the difference between unsharp and converted unsharp. Thus, Applicant believes that it would not

be obvious to modify Equations 6 and 13 of Ito to achieve the present invention, since Ito does not suggest differential processing of the unsharp image-signal and converted unsharp image-signal.

Claims 2-13 are dependent upon claim 1, while claims 15-26 are dependent upon claim 14. Applicant therefore respectfully submits that Ito does not teach or suggest claims 1 and 14.

2. Claims 27-38: Ito does not teach or suggest applying conversion-processing to the differential image signals where the conversion-processing varies depending on pixel values of the unsharp image-signals as recited in claim 27

Applicant has discovered that overshoot/undershoot of the image signal can be controlled by adding conversion-processing that approximates the pixels of the image and the image in the adjacent frequency band. Thus, frequency emphasis in the low density area is weakened, grain deterioration is controlled and sharper images are produced (page 50, lines 3-12).

Claim 27 is directed to this aspect of the present invention as claim 27 recites that conversion-processing varies depending on the pixel values of unsharp image-signals.

The Examiner had cited the variable F_{usm} in Equation 7 at col. 16 of Ito to teach varying conversion-processing depending on the pixel values of unsharp image-signals (see page 15 of the

Office Action). However, the variable F_{usm} is unrelated to the pixels of unsharp image-signals. It appears that the variable F_{usm} is a mathematical variable which represents the final two lines of equation 7 of Ito which subtract the original and unsharp image-signals. Applicant therefore respectfully submits that F_{usm} does not relate to varying conversion-processing depending on pixel values of unsharp image-signals as recited in claim 27.

Instead, Ito teaches band-limited image signals (col. 15, lines 4-5, col. 16, line 30 and col. 17, lines 5-25. The band-limited image signals are not the conversion-processing of claim 27.

Furthermore, Applicant notes that the remainder of Ito does not suggest approximating pixels in images of adjacent frequency bands. Thus, Ito does not suggest varying conversion-processing depending on the pixels of the unsharp image-signals as recited in claim 27.

Claims 28-38 are ultimately dependent upon claim 27, thus, it is submitted that claims 27-38 are patentable over Ito.

3. Claims 39-48 and 73-81: Ito fails to teach repetitions of filter-processing with a simple average filter as recited in claims 39 and 73

As discussed above, Applicants have amended claim 39 to include the limitations of claim 42, and claim 73 to include the limitations of claim 75. In the Office Action, the Examiner had cited col. 10, lines 49-53 of Ito to teach repetitions of filter-processing with a simple average filter. In addition, Applicant notes that Ito teaches a 5x5 two dimensional filter at col. 11, lines 40-41.

At pages 21 and 31 of the Office Action, the Examiner had stated that the low pass filter of Ito is a simple average filter. However, Applicant respectfully disagrees.

Those skilled in the art understand that the low pass filter of Ito has distributed weighting coefficients. In contrast, those skilled in the art also understand that the simple average filter of claims 39 and 73 has averaged weighting coefficients. Thus, the filter of Ito is not the filter of claims 39 and 73. Furthermore, the 5x5 two-dimensional filter of Ito is not the simple average filter of claims 39 and 73.

Applicants respectfully submit that claims 39-48 and 73-81 are patentable over Ito.

Claims 40-48 are dependent upon claim 39, claims 50-60 are dependent upon claim 49, claims 62-72 are dependent upon claim

61 and claims 74-81 are dependent upon claim 73. Respectfully, claims 39-81 are patentable over Ito as well.

I. Conclusion

In view of the foregoing, it is respectfully submitted that the application is in condition for allowance and such action is respectfully requested. Should any extensions of time or fees be necessary in order to maintain this Application in pending condition, appropriate requests are hereby made and authorization is given to debit Account # 02-2275.

Respectfully submitted,

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